

AMENDMENT (1)
(Amendment based on Article 11)

To: Examiner of the Patent Office

1. Identification of International application
PCT/JP03/00619

2. Applicant

Name: SUZUKA FUJI XEROX Co., Ltd.
Address: 1900, Ifuna-cho, Suzuka-city, Mie 519-0393 Japan
Country of nationality: JAPAN
Country of residence: JAPAN

3. Agent

Name: USAMI Tadao Registered seal
Address: No.102, 32, Tsukimigaoka, Yatomi-cho, Mizuho-ku,
Nagoya-shi, AICHI 467-0035, JAPAN

4. Item to be Amended : Specification and Claims

5. Subject Matter of Amendment:

(1) The expression "wherein said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article" which appears on page 2 lines 19 to 20 in the specification should be amended as " in the case of injection-molding, wherein the same mold as used to mold a molded article made of virgin thermoplastic resin is used to mold said molded article and said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article".

(2) The expression "A method for manufacturing a molded article comprising molding a recycled thermoplastic resin or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an amount of at least 1% by weight by gas assist injection molding or expansion

expansion injection molding, wherein said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article” which appears on claim 1 of page 29 should be amended as “ A method for manufacturing a molded article comprising molding a recycled thermoplastic resin or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an amount of at least 1 % by weight, by gas assist injection molding or expansion injection molding , wherein the same mold as used to mold a molded article made of virgin thermoplastic resin is used to mold said molded article and said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article”.

6. List of Attached Documents

- (1) Replacement sheets of page2 and 2/1 of the specification
- (2) Replacement sheet of page 29 of the claims

prevent the properties of the material from degrading, the melt fluidity of the thermoplastic resin changes. Said change of melt fluidity may impair the filling property of said melted thermoplastic resin in the mold, and defects such as sink, warping, bending, and the like, may be produced in the resulting resin molded article.

Further, due to changing mold shrinkage in the molding process, the dimensional accuracy of the resulting molded article may be affected.

To solve above described problems, a means to raise injection pressure may be considered, however, since said thermoplastic resin's melt fluidity is subject to change whenever recycled, the conditions of injection-molding such as injection pressure, injection temperature, and the like should be newly settled whenever said recycled thermoplastic resin is injection-molded, so that design of mold should be changed whenever said recycled thermoplastic resin is injection-molded.

DISCLOSURE OF THE INVENTION

The present invention provides a method for manufacturing a molded article comprising molding recycled thermoplastic resin or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an amount of at least 1% by weight, by gas assist injection molding or expansion injection molding, in the case of injection-molding, the same mold as used to mold a molded article made of virgin thermoplastic resin is used to mold said molded article and said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article.

Herein said discarded thermoplastic resin molded article includes used resin molded article withdrawn from the market, fin, flash, or spew produced during the molding process, thermoplastic resin accumulated in the sprue, runner, and the like in the injection molding machine, cutting or shaving dust produced in the trimming process, and assembly process of resin products and products being of bad quality.

Useful thermoplastic resins for the present invention are styrenic resin and olefinic resin, especially thermoplastic resins containing diene group rubber and/or olefinic rubber and/or acrylic rubber. When said recycled thermoplastic resin or said mixture is injection-molded, 1 to 5 % by weight of rubber-like material having compatibility with said thermoplastic resin is preferably added to said thermoplastic resin as a recycle aid agent.

In a case where said thermoplastic resin is a styrenic resin, a graft polymer in which a diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) the trunk and polymer chain having compatibility with said styrenic resin is grafted polymer chain, is

preferably selected as rubber-like material having compatibility with said styrenic resin,
and in the case where said thermoplastic resin is olefinic resin, ethylene- α -olefin

CLAIMS

1. (Amended) A method for manufacturing a molded article comprising molding a recycled thermoplastic resin or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an amount of at least 1 % by weight, by gas assist injection molding or expansion injection molding, wherein the same mold as used to mold a molded article made of virgin thermoplastic resin is used to mold said molded article and said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article
2. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 1, wherein said thermoplastic resin is styrenic resin
3. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 1, wherein said thermoplastic resin is olefinic resin
4. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 3, wherein said thermoplastic resin contains diene group rubber and /or olefinic rubber and/or acrylic rubber
5. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 4, wherein a rubber like material having compatibility with said thermoplastic resin is added to said recycled thermoplastic resin or said mixture as a recycle aid agent in an amount of 1 to 5% by weight when said recycled thermoplastic resin or said mixture is injection-molded
6. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is styrenic resin and said rubber like material is a graft polymer in which diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) a trunk and a polymer chain having compatibility with said styrenic resin is a grafted polymer chain
7. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is olefinic resin and said rubber like material is ethylene- α -olefin copolymer
8. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 7, wherein paint or ink using thermoplastic resin having compatibility with said thermoplastic resin or thermosetting resin as a vehicle is applied to the surface of said molded article made of recycled thermoplastic resin

REPLY

To: Examiner of the Patent Office

1. Identification of International application

PCT/JP03/00619

2. Applicant

Name: SUZUKA FUJI XEROX Co., Ltd.

Address: 1900, Ifuna-cho, Suzuka-city, Mie 519-0393 Japan

Country of nationality: JAPAN

Country of residence: JAPAN

3. Agent

Name: USAMI Tadao Registered seal

Address: No.102, 32, Tsukimigaoka, Yatomi-cho, Mizuho-ku,
Nagoya-shi, AICHI 467-0035, JAPAN

4. Date of Notification : 25.11.03

5. Subject Matter of Reply : 1

1. The present invention

In the present invention, the gas assist injection molding method or the expansion injection molding method is applied to injection molding of the recycled thermoplastic resin to obtain the recycled resin molded article having a good dimension stability and so a high commercial value without defects such as sink, warping, bending, and the like. Further in the present invention, the recycle aid agent and/or the virgin thermoplastic resin is(are) added to the recycled thermoplastic resin to improve the mechanical properties of the resulting resin molded article so as to be the substantially equal mechanical properties of the virgin resin molded article.

2. Referenced cited documents

In referenced cited document 1(WO 97/38838A1), applying the gas assist injection molding to mold the recycled thermoplastic resin is disclosed (EXAMPLE4). Nevertheless, adding the recycle aid agent or the virgin thermoplastic resin to the recycled thermoplastic resin is not disclosed in this referenced cited document.

Further, although this referenced cited document discloses method for manufacturing the common foamed molded article(P97 to 75), applying the expansion injection molding method to mold the recycled thermoplastic resin is not disclosed.

In referenced cited document 2(JP8-59967 A), although applying the expansion injection molding to mold the large sized molded article of recycled polyethylene terephthalate (P7 column 11, line 5 to 30) disclosed, adding the recycle aid agent or the virgin thermoplastic resin to the recycled thermoplastic resin is not disclosed.

In referenced cited document 3 (JP2001-323130A), it is disclosed that when inflammable thermoplastic resin molded article containing a graft copolymer containing a rubber like polymer (A), a vinyl (CO) polymer (B), a flame reterdant (C) and antimony oxide(D) is recycled, a fluoro carbon resin is added to said molded article to keep inflammability, impact resistance, and thermalstability without spoiling them, but adding the recycle aid agent and applying the gas assist injecting molding or the expansion injection molding in the present invention are not described.

In referenced cited document 4 (JP2001-353742A), injection molding, wherein carbon dioxide is dissolved in the recycled thermoplastic resin is described but adding the recycle aid agent or the virgin thermoplastic resin to said recycled resin is not described.

In referenced cited document 5(JP2001-38720A), a recycling system is disclosed, said recycling system being that discarded electric appliances for home use is dismantled to withdraw the painted resin molded article, said painted resin molded article is crushed the broken pieces, the virgin resin materials, the compatibility improving agent, or the modifier is added to said broken pieces to be melted and mixed and the resulting mixture is molded after pelletizing said mixture, but this referenced cited document does not describe about the recycle aid agent, and applying the gas assist injection molding or the expanding injection molding.

As above mentioned, the gist of the present invention that adding the recycle aid agent or the virgin thermoplastic resin to the recycled thermoplastic resin (I), and applying the gas assist injection molding method or the expansion injection molding method (II) are not disclosed in these referenced cited documents. To attain the above mentioned effects of the present invention that can provide a recycled resin molded article having a good dimension stability and the equal mechanical properties to the virgin thermoplastic resin molded article, the conditions (I)and(II) are essential. Accordingly, it is considered that no effects of

the present invention are attained in the disclosures of referenced cited document 1 to 5 so that the present invention has the invention step.

6. List of Attached Document : Amendment

AMENDMENT(2)

(Amendment based on Article 11)

To: Examiner of the Patent Office

1. Identification of International application**PCT/JP03/00619****2. Applicant****Name: SUZUKA FUJI XEROX Co., Ltd.****Address: 1900, Ifuna-cho, Suzuka-city, Mie 519-0393 Japan****Country of nationality: JAPAN****Country of residence: JAPAN****3. Agent****Name: USAMI Tadao Registered seal****Address: No.102, 32, Tsukimigaoka, Yatomi-cho, Mizuho-ku,
Nagoya-shi, AICHI 467-0035, JAPAN****4. Item to be Amended : Claims****5. Subject Matter of Amendment:**

- (1) The expression " A method for manufacturing a molded article comprising molding a recycled thermoplastic resin or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an amount of at least 1 % by weight, by gas assist injection molding or expansion injection molding , wherein the same mold as used to mold a molded article made of virgin thermoplastic resin is used to mold said molded article and said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article" which appears on page29 should be amended as " A method for manufacturing a molded article comprising molding a recycled thermoplastic resin containing a recycle aid agent, or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an

amount of at least 1 % by weight, or a mixture of said recycled thermoplastic resin and said virgin thermoplastic resin and said recycle aid agent, said mixture containing said recycled thermoplastic resin in an amount of at least 1% by weight for said virgin thermoplastic resin, by gas assist injection molding or expansion injection molding, wherein said recycled thermoplastic resin is recovered from discarded thermoplastic resin molded article”.

- (2) “A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 4, wherein a rubber like material having compatibility with said thermoplastic resin is added to said recycled thermoplastic resin or said mixture as a recycle aid agent in an amount, of 1 to 5% by weight when said recycled thermoplastic resin or said mixture is injection-molded” which appears on claim 5 of page 29 should be amended as “A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 4, wherein said recycle aid agent is a rubber like material having compatibility with said thermoplastic resin and said rubber like material is added to said thermoplastic resin in an amount 1 to 5% by weight.”
- (3) “A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is styrenic resin and said rubber like material is a graft polymer in which diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) a trunk and a polymer chain having compatibility with said styrenic resin is a grafted polymer chain” which appears on claims 6 of page 29 should be amended as “ A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is styrenic resin and said rubber like material as an recycled aid agent is a graft polymer in which diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) a trunk and a polymer chain having compatibility with said styrenic resin is a grafted polymer chain”.
- (4)” A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is olefinic resin and said rubber like material is ethylene- α -olefin copolymer” which appears on claims 7 of page 29 should be amended as “ A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is olefinic resin and said rubber like material as an recycled aid

agent is ethylene- α -olefin copolymer".

(5) Claim 9 which appears on page 29/1 should be added.

6. List of Attached Documents

(1) Replacement sheet of page 29 and 29/1 of the claims

CLAIMS

1. (Amended) A method for manufacturing a molded article comprising molding a recycled thermoplastic resin containing a recycle aid agent, or a mixture of said recycled thermoplastic resin, and virgin thermoplastic resin said mixture containing said recycled thermoplastic resin in an amount at least 1 % by weight, or a mixture of said recycled thermoplastic resin and said virgin thermoplastic resin and said recycle aid agent, said mixture containing said recycled thermoplastic resin in an amount of at least 1% by weight for said virgin thermoplastic resin, by the gas assist injection molding or expansion injection molding, wherein said recycled thermoplastic resin is recovered from discarded thermoplastic resin molded article
2. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 1, wherein said thermoplastic resin is styrenic resin
3. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 1, wherein said thermoplastic resin is olefinic resin
4. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 3, wherein said thermoplastic resin contains diene group rubber and /or olefinic rubber and/or acrylic rubber
5. (Amended) A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 4, wherein said recycle aid agent is a rubber like material having compatibility with said thermoplastic resin and said rubber like material is added to said thermoplastic resin in an amount, of 1 to 5% by weight.
6. (Amended) A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is styrenic resin and said rubber like material as an recycle aid agent is a graft polymer in which diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) a trunk and a polymer chain having compatibility with said styrenic resin is a grafted polymer chain
7. (Amended) A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is olefinic resin and said rubber like material as an recycle aid agent is ethylene- α -olefin copolymer
8. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 7, wherein paint or ink using thermoplastic resin having compatibility with said thermoplastic resin or thermosetting resin as a vehicle is applied to

the surface of said molded article made of recycled thermoplastic resin

9. (New) A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 8, wherein non yellowing type cellulose derivative is added to said paint or said ink

AMENDMENT(3)
(Amendment based on Article 11)

To: Examiner of the Patent Office

1. Identification of International application
PCT/JP03/00619

2. Applicant

Name: SUZUKA FUJI XEROX Co., Ltd.
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Name: USAMI Tadao Registered seal
Address: No.102, 32, Tsukimigaoka, Yatomi-cho, Mizuho-ku,
Nagoya-shi, AICHI 467-0035, JAPAN

4. Item to be Amended : Claims

5. Subject Matter of Amendment:

- (1) The expression " A method for manufacturing a molded article comprising molding a recycled thermoplastic resin or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an amount of at least 1 % by weight, by the gas assist injection molding or expansion injection molding , wherein the same mold as used to mold a molded article made of virgin thermoplastic resin is used to mold said molded article and said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article" which appears on page29 should be amended as " A method for manufacturing a molded article comprising molding a recycled thermoplastic resin containing a recycle aid agent, or a mixture of said recycled thermoplastic resin, and virgin thermoplastic resin said mixture containing said recycled thermoplastic resin

in an amount of at least 1 % by weight, or a mixture of said recycled thermoplastic resin and said virgin thermoplastic resin and said recycle aid agent, said mixture containing said recycled thermoplastic resin in an amount of at least 1% by weight for said virgin thermoplastic resin, by gas assist injection molding or expansion injection molding, wherein said recycled thermoplastic resin is recovered from discarded thermoplastic resin molded article”.

- (2) “A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 4, wherein a rubber like material having compatibility with said thermoplastic resin is added to said recycled thermoplastic resin or said mixture as a recycle aid agent in an amount, of 1 to 5% by weight when said recycled thermoplastic resin or said mixture is injection-molded” which appears on claim 5 of page 29 should be amended as “A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 4, wherein said recycle aid agent is a rubber like material having compatibility with said thermoplastic resin and said rubber like material is added to said thermoplastic resin an amount 1 to 5% by weight.”
- (3) “A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is styrenic resin and said rubber like material is a graft polymer in which diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) a trunk and a polymer chain having compatibility with said styrenic resin is a grafted polymer chain” which appears on claims 6 of page 29 should be amended as “ A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is styrenic resin and said rubber like material as an recycled aid agent is a graft polymer in which diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) a trunk and a polymer chain having compatibility with said styrenic resin is a grafted polymer chain”.
- (4) “A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is olefinic resin and said rubber like material is ethylene- α -olefin copolymer” which appears on claims 7 of page 29 should be amended as “ A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is olefinic resin and said rubber like material as an recycled aid

agent is ethylene- α -olefin copolymer".

- (5) "A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 8, wherein sheeting made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article is stuck on the surface of said mold using adhesive made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article or thermosetting resin" which appears on claims 9 of page 30 should be amended as "A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 8, wherein non yellowing type cellulose derivative is added to said paint or said ink".
- (6) "A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 9, wherein said molded article made of recycled thermoplastic resin consists of a main body and attachment(s) attached to said main body using adhesive or a welding molding rod, and said adhesive being made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article or thermosetting resin and said welding rod being made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article" which appears on claims 10 of page 30 should be amended as "A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 9, wherein sheeting made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article is stuck on the surface of said mold using adhesive made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article or thermosetting resin".
- (7) Claim 11 which appears on page 30 should be added.

6. List of Attached Documents

- (1) Replacement sheets of page 29, 29/1 and 30 of the claims

CLAIMS

1. A method for manufacturing a molded article comprising molding a recycled thermoplastic resin or a mixture of said recycled thermoplastic resin and virgin thermoplastic resin, said mixture containing said recycled thermoplastic resin in an amount of at least 1% by weight, by gas assist injection molding or expansion injection molding, wherein said recycled thermoplastic resin is recovered from a discarded thermoplastic resin molded article
2. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 1, wherein said thermoplastic resin is styrenic resin
3. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 1, wherein said thermoplastic resin is olefinic resin
4. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 3, wherein said thermoplastic resin contains diene group rubber and /or olefinic rubber and/or acrylic rubber
5. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 4, wherein a rubber like material having compatibility with said thermoplastic resin is added to said recycled thermoplastic resin or said mixture as a recycle aid agent in an amount of 1 to 5% by weight when said recycled thermoplastic resin or said mixture is injection-molded
6. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is styrenic resin and said rubber like material is a graft polymer in which diene group rubber and/or olefinic rubber and/or acrylic rubber is(are) a trunk and a polymer chain having compatibility with said styrenic resin is a grafted polymer chain
7. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claim 5, wherein said thermoplastic resin is olefinic resin and said rubber like material is ethylene- α -olefin copolymer
8. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 7, wherein paint or ink using thermoplastic resin having compatibility with said thermoplastic resin or thermosetting resin as a vehicle is applied to the surface of said molded article made of recycled thermoplastic resin

9. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 8, wherein sheeting made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article is stuck on the surface of said mold using an adhesive made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article or thermosetting resin
10. A method for manufacturing a molded article made of recycled thermoplastic resin in accordance with claims 1 to 9, wherein said molded article made of recycled thermoplastic resin consists of a main body and attachment(s) attached to said main body using an adhesive or a welding molding rod, and said adhesive being made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article or thermosetting resin and said welding rod being made of thermoplastic resin having compatibility with said thermoplastic resin of said molded article